

Patent Claims

1. Optical shutter for the beam path in optical devices comprising a mounting unit (2) which is provided with a diaphragm aperture, a stepper motor (3) which is mounted at the mounting unit (2), and a shutter element (4) which is connected to the motor shaft of the stepper motor for opening and closing the diaphragm aperture, wherein a two-phase stepper motor (3) with a large full step angle is preferably used, which two-phase stepper motor (3) is connected to a control unit and carries out the required movement of the shutter element (4) at a short distance from the motor shaft.
2. Optical shutter according to claim 1, wherein a two-phase stepper motor (3) with a claw-pole construction of the rotor and stator is used.
3. Optical shutter according to at least one of the preceding claims, wherein the movement of the shutter element (4) is limited to a movement range of less than n full steps by a stop pin (5) in the two end positions, respectively.
4. Optical shutter according to at least one of the preceding claims, wherein an end-position sensor (6) which is fastened to the mounting unit (2) and determines the position of the shutter element (4) is provided in addition.
5. Method for controlling the optical shutter, wherein the movement of the shutter element (4) fastened to the motor shaft is carried out in that the 180-degree rotation of the electromagnetic field in the stator of the stepper motor (3), and therefore a corresponding rotation of the motor shaft by n full steps, is carried out by the control unit.
6. Method according to claim 5, wherein a reversal of the current direction in the two windings of the stepper motor (3) is carried out by the control unit for moving the shutter element (4) that is fastened to the motor shaft.
7. Method according to at least one of claims 5 to 6, wherein a retarded reversal of the current direction in the individual windings of the stepper motor (3) is carried out by the control unit for directed movement of the shutter element (4).

8. Method according to at least one of claims 5 to 7, wherein a simultaneous reversal of the current direction in the individual windings of the stepper motor (3) is carried out by the control unit for the directed movement of the shutter element (4) when the mechanical rotation of the rotor is limited by stop pins (5) to a movement range less than n full steps.

9. Method according to at least one of claims 5 to 8, wherein the winding currents of the individual windings of the stepper motor (3) are reduced after reaching the end position of the shutter element (4), wherein the end position is reached after n full steps or when one of the stop pins (5) is contacted.

10. Method according to at least one of claims 5 to 9, wherein the winding currents of the individual windings of the stepper motor (3) are switched off, respectively, after the end position of the shutter element (4) is reached when the self-holding torque of the stepper motor (3) is large enough to hold the shutter element (4) in the respective end position.

11. Method according to at least one of claims 5 to 10, wherein the closing of the diaphragm aperture by the shutter element (4) is ensured when the optical device is put into operation by evaluating the signal of the end-position sensor (6).

12. Method according to at least one of claims 5 to 10, wherein the windings of the stepper motor (3) are acted upon by a predetermined current direction when the optical device is put into operation in order to ensure that the diaphragm opening is closed by the shutter element (4).